

write your name here

Surname	Other names
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Centre Number

Candidate Number

**Edexcel GCSE**

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# Mathematics B

**Unit 2: Number, Algebra, Geometry 1  
(Non-Calculator)**

**Higher Tier**

Friday 12 November 2010 – Morning

**Time: 1 hour 15 minutes**

Paper Reference

**5MB2H/01**

**You must have:**

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

--

## Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators must not be used.**

SOLUTIONS



## Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed – *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

## Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

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Turn over ►

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 Grace and Jack share £140 in the ratio 3 : 4

Work out the amount of money that Jack gets.

$$3+4=7 \text{ parts}$$

$$1 \text{ part} = \frac{140}{7} = \pounds 20. \quad \square$$

$$3:4 = \pounds 60 : \pounds 80$$

$\square$

£ 80

(Total for Question 1 is 2 marks)

2 (a) Simplify  $4b \times 2c$

$$8bc$$

(1)

(b) Expand  $3(2w - 5t)$

$$6w - 15t$$

$$6w - 15t$$

(2)

(c) Expand and simplify  $(x + 7)(x - 2)$

$$= x^2 - 2x + 7x - 14 \quad \square \text{ even if } + \text{ - errors}$$

$$= x^2 + 5x - 14 \quad \square \text{ or one number wrong.}$$

(2)

(Total for Question 2 is 5 marks)

3 Work out 15% of £80

$$0.15 \times 80 = 0.3 \times 40 = 3 \times 4 = \pounds 12 \quad \square$$

$\square$

£ .....

(Total for Question 3 is 2 marks)

4

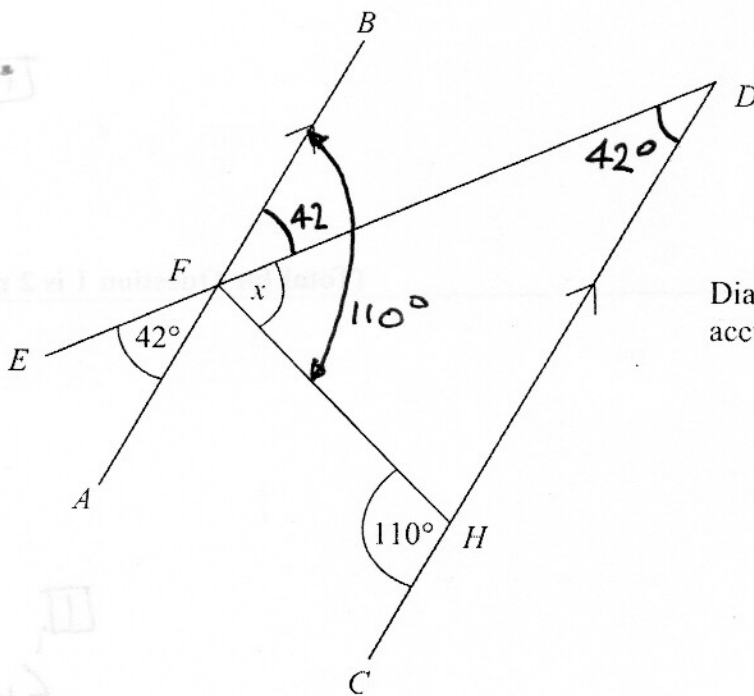


Diagram NOT accurately drawn

*AFB* and *CHD* are parallel lines.  
*EFD* is a straight line.

Work out the size of the angle marked *x*.

$$\angle FDH = 42^\circ, \text{ corresponding angle to } EFA. \quad \square$$

$$x + 42 = 110, \text{ external angle} = \text{sum of opposite two internal angles in a triangle.} \quad \square$$

$$x = 110 - 42 = 68^\circ$$

OR  $BFF = 110^\circ$ , alternate to  $FHC$ .

$$= x + 42^\circ$$

$$\therefore x = 68^\circ$$

$$x = 68^\circ$$

(Total for Question 4 is 3 marks)

5 Find the Lowest Common Multiple (LCM) of 8 and 12

Highest common factor = 4 ( $8 = 4 \times 2$ ,  
 $12 = 4 \times 3$ )

$$\text{LCM} = \frac{8 \times 12}{4} = 2 \times 12 = 24$$

or  $8 \rightarrow 8, 16, 24, 32, \dots$   
 $12 \rightarrow 12, 24, 36, \dots$

or  $8 = 2^3$   
 $12 = 2^2 \times 3$

$$\text{LCM} = 2^3 \times 3 = 24.$$

24

(Total for Question 5 is 2 marks)

6 The diagram shows 3 sides of a regular polygon.

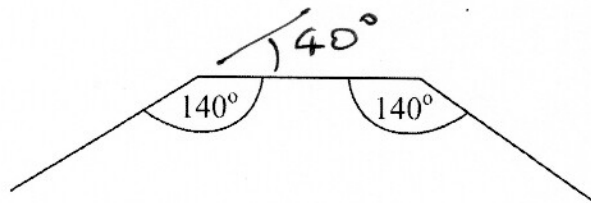


Diagram NOT  
accurately drawn

Each interior angle of the regular polygon is  $140^\circ$ .

Work out the number of sides of the regular polygon.

$$\text{Exterior angle } 180 - 140 = 40^\circ = \frac{360}{n}$$

$$40n = 360$$

$$n = \frac{360}{40} = 9 \text{ sides} - \boxed{9}$$

$\boxed{9}$

(Total for Question 6 is 3 marks)

- 7 You can use this formula to change a temperature  $C$ , in  $^{\circ}\text{C}$ , to a temperature  $F$ , in  $^{\circ}\text{F}$ .

$$F = 1.8C + 32$$

- (a) Use the formula to change  $20^{\circ}\text{C}$  into  $^{\circ}\text{F}$ .

$$F = 1.8 \times 20 + 32 \quad \boxed{1}$$

$$= 36 + 32 = 68^{\circ}\text{F} \quad \boxed{1}$$

..... 68  $^{\circ}\text{F}$

(2)

- (b) On the grid opposite, draw a conversion graph that can be used to change between temperatures in  $^{\circ}\text{C}$  and temperatures in  $^{\circ}\text{F}$ .

(3)

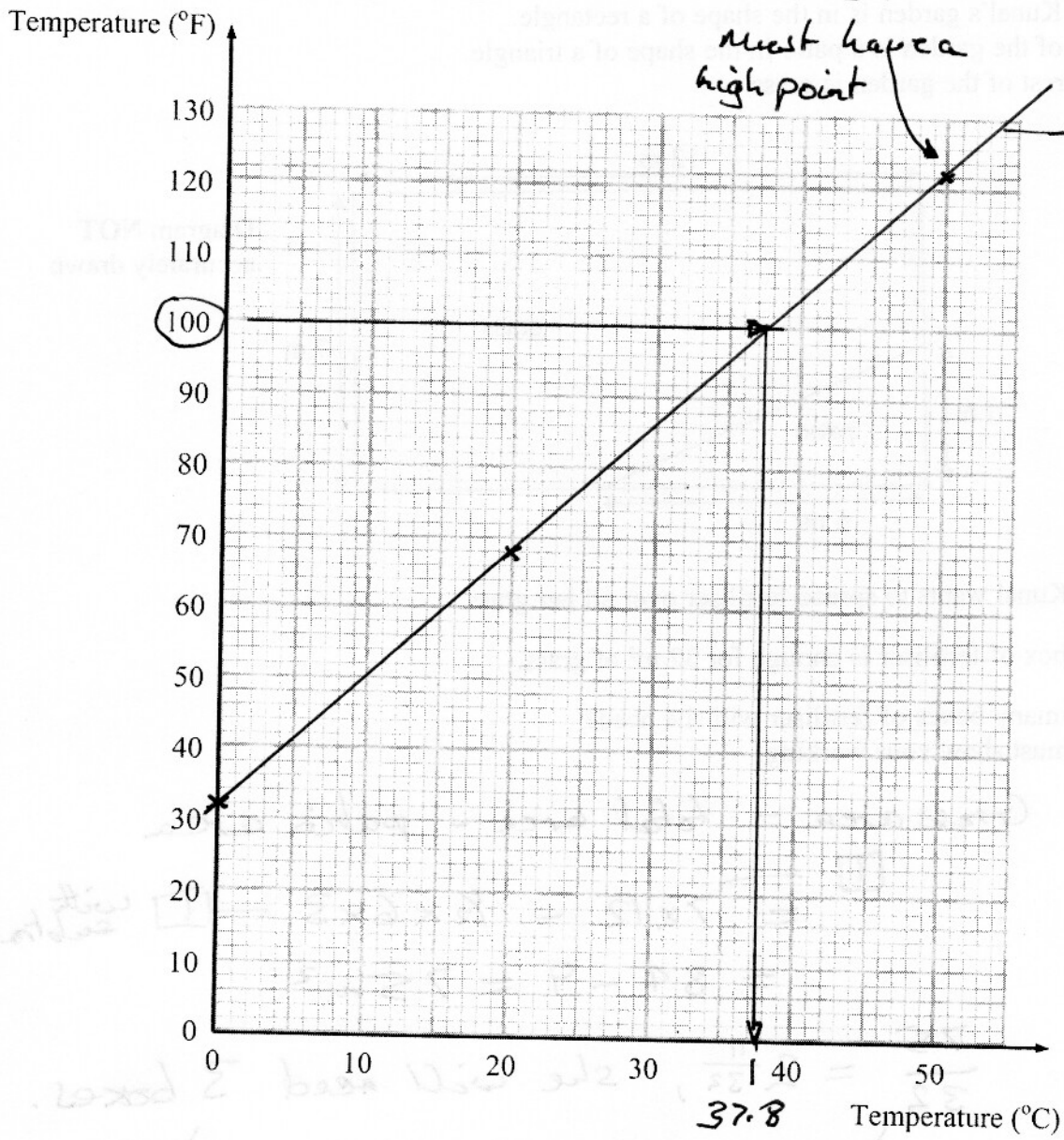
- (c) Use your graph to change  $100^{\circ}\text{F}$  into  $^{\circ}\text{C}$ .

$$\boxed{1} - \text{value } P = \frac{360}{40} \quad \underline{37.8} \quad ^{\circ}\text{C}$$

(1)

(36 to 39 allowed).

$$C = 50 \rightarrow F = 1.8 \times 50 + 32 = 90 + 32 = 122^{\circ}F$$



(Total for Question 7 is 6 marks)

- 8 Mrs Kunal's garden is in the shape of a rectangle.  
Part of the garden is a patio in the shape of a triangle.  
The rest of the garden is grass.

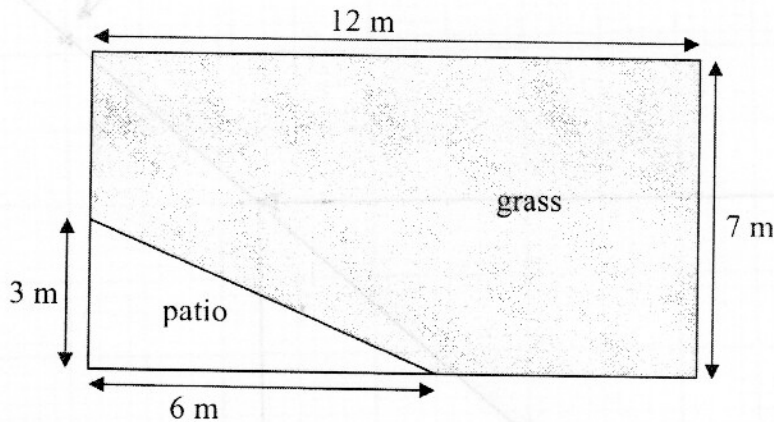


Diagram NOT accurately drawn

Mrs Kunal wants to spread fertiliser over all her grass.

One box of fertiliser is enough for  $32 \text{ m}^2$  of grass.

How many boxes of fertiliser will she need?

You must show your working.

$$\text{Grass area} = \text{total area} - \text{patio area}$$

$$\begin{aligned} &= 7 \times 12 - \frac{1}{2} \times 6 \times 3 \quad \text{with subtraction} \\ &= 84 - 9 = 75 \text{ m}^2 \end{aligned}$$

$$\frac{75}{32} = 2 \frac{11}{32}, \text{ she will need 3 boxes.}$$

(Total for Question 8 is 4 marks)

9 Last year, Jora spent

30% of his salary on rent

$\frac{2}{5}$  of his salary on entertainment

$\frac{1}{4}$  of his salary on living expenses.

He saved the rest of his salary.

Jora spent £3600 on living expenses.

Work out how much money he saved.

£3600 living expenses is  $\frac{1}{4}$  of his salary, so  
his salary is  $3600 \times 4 = \text{£}14400$  [1]

Of this, he spends  $0.3 + 0.4 + 0.25 = 0.95$  [1]  
of it so he saves  $\text{£}14400 \times 0.05$  [1]

or  $\frac{\text{£}1440}{2}$   
 $= \text{£}720$ .

$$= 144 \times 5$$
$$= 72 \times 10 = \text{£}720$$

£ 720

(Total for Question 9 is 5 marks)



10 (a) Factorise fully  $20w^2y + 24wy^3 = 4(5w^2y + 6wy^3)$   
 $= 4wy(5w + 6y^2)$

1
1

(2)

(b) Factorise  $m^2 + 3m - 40$

Factors of  $-40$  are

$-1 \times 40$

$-2 \times 20$

$-4 \times 10$

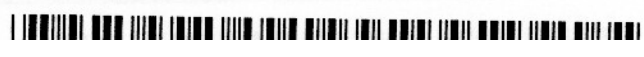
$-5 \times 8$  adds to 3

$(m-5)(m+8)$  2

(1 if +- wrong).

(Total for Question 10 is 4 marks)

*[Faint handwritten notes and calculations, including '29.0 = 25.0 + 4.0 + 0.0', '20.0 x 0.0041', '2 x 0.41 =', '0.05 x 10 = 0.5', and '0.5 x 10 = 5']*



11 A water trough is in the shape of a prism.

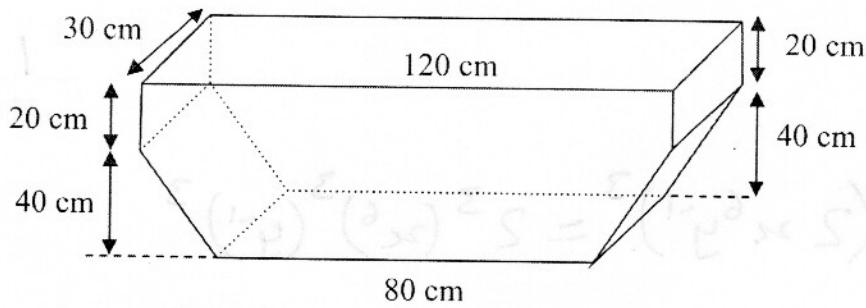


Diagram NOT accurately drawn

Hamish fills the trough completely.

Water leaks from the bottom of the trough at a constant rate.

2 hours later, the level of the water has fallen by 20 cm.

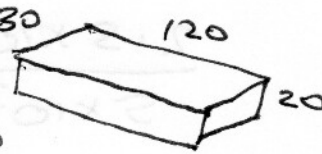
Water continues to leak from the trough at the same rate.

How many more minutes will it take for the trough to empty completely?

The top 20 cm is a cuboid

$$\text{Volume of cuboid} = 30 \times 120 \times 20$$

$$= 72000 \text{ cm}^3$$



The leakage rate is  $\frac{72000 \text{ cm}^3}{2 \text{ hours}} = 36000 \text{ cm}^3/\text{hour}$ .

The trapezium has area  $\frac{(a+b)h}{2}$

$$= \frac{(120+80) \times 40}{2}$$

$$= 100 \times 40 = 4000 \text{ cm}^2$$

so the volume of water remaining after 2 hours is  $4000 \text{ cm}^2 \times 30 \text{ cm}$

$$= 120000 \text{ cm}^3$$

$$\text{Time to empty this} = \frac{120000}{36000} = \frac{120}{36} = \frac{10}{3} \text{ hours}$$

$$= \frac{10}{3} \times 60 \text{ minutes}$$



200 minutes

(Total for Question 11 is 6 marks)



12 (a) Simplify  $m^0$

1  
.....  
(1)

(b) Simplify  $(2x^6y^{-1})^3$

$$\begin{aligned}(2x^6y^{-1})^3 &= 2^3(x^6)^3(y^{-1})^3 \\ &= 8x^{18}y^{-3}\end{aligned}$$

.....  
(2)

(Total for Question 12 is 3 marks)

13 Work out  $(2.5 \times 10^9) \div (5 \times 10^3)$ .  
Give your answer in standard form.

$$\begin{aligned}\frac{2.5 \times 10^9}{5 \times 10^3} &= \frac{2.5}{5} \times 10^6 \\ &= 0.5 \times 10^6 \\ &= 5 \times 10^5\end{aligned}$$

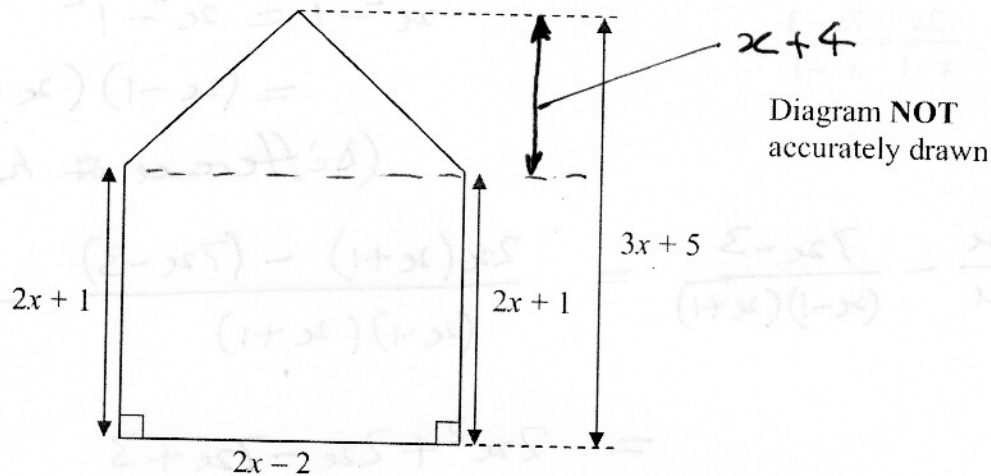
} — [1]

— [1]

(Total for Question 13 is 2 marks)



\*14 The diagram shows a pentagon.



All measurements are in centimetres.

Show that the area of this pentagon can be written as  $5x^2 + x - 6$

Area of rectangle + triangle

$$= \underbrace{(2x-2)(2x+1)}_{\square} + \frac{1}{2}(2x-2)(x+4) \quad \square$$

$$= 4x^2 + 2x - 4x - 2 + (x-1)(x+4)$$

$$= 4x^2 - 2x - 2 + x^2 + 4x - x - 4 \quad \square$$

$$= 5x^2 + x - 6 \quad \square \text{ if all previous working clearly shown.}$$

(Total for Question 14 is 4 marks)

15 Write as a single fraction in its simplest form

$$\frac{2x}{x-1} - \frac{7x-3}{x^2-1}$$

$$x^2-1 = x^2-1^2$$

$$= (x-1)(x+1) \quad \boxed{1}$$

(Difference of two squares)

$$\frac{2x}{x-1} - \frac{7x-3}{(x-1)(x+1)} = \frac{2x(x+1) - (7x-3)}{(x-1)(x+1)} \quad \boxed{1}$$

$$= \frac{2x^2 + 2x - 7x + 3}{(x-1)(x+1)}$$

$$= \frac{2x^2 - 5x + 3}{(x-1)(x+1)} \quad \boxed{1}$$

$$= \frac{(2x-3)(x-1)}{(x-1)(x+1)} = \frac{2x-3}{x+1} \quad \boxed{1}$$

$$2x^2 - 5x + 3,$$

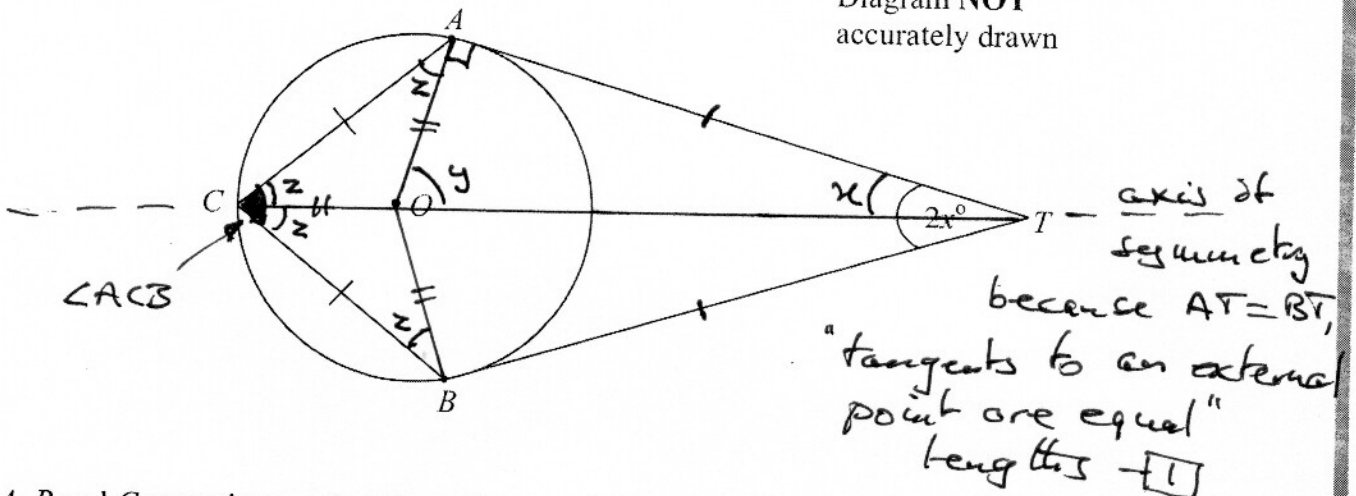
$$ac = 6 = \boxed{-2 \times -3}$$

$$\left(2x - \frac{3}{1}\right) \left(x - \frac{2}{2}\right)$$

$$= (2x-3)(x-1)$$

(Total for Question 15 is 4 marks)

Diagram NOT  
accurately drawn



$A$ ,  $B$  and  $C$  are points on the circumference of the circle, centre  $O$ .  
 $TA$  and  $TB$  are tangents to the circle.  
 $CA = CB$ .  
 Angle  $ATB = 2x^\circ$ .

Prove that angle  $ACB = (90 - x)^\circ$ .

Angles in triangle  $OAT$  add to  $180^\circ$   
 and  $\angle OAT = 90^\circ$  (tangent  $AT$  perpendicular to  
 radius  $OA$ ). — [1]

$$\text{Hence } y + x + 90 = 180, \quad y = 180 - 90 - x \\ = 90 - x \quad \text{— [1]}$$

Lengths  $OA, OB, OC$  are equal (radii of circle) so  
 $OAC$  and  $OBC$  are isosceles triangles and the angles  
 " $z$ " are all equal. — [1]

$$z + z = y \quad (\text{external angle} = \text{sum of two opposite} \\ \text{internal angles}).$$

$$\begin{aligned} \angle ACB &= z + z \\ &= y \\ &= 90 - x. \quad \text{— [1]} \end{aligned}$$

(Total for Question 16 is 5 marks)

TOTAL FOR PAPER IS 60 MARKS